

REMARKS

Thorough examination and careful review of the application by the Examiner is noted and appreciated.

Claims 1-10 are pending in the application. Claims 1-10 stand rejected.

Claim Rejections Under 35 USC §103

Claims 1-10 are rejected under 35 USC §103(a) as being unpatentable over the admitted prior art in view of Moffat '393 and further in view of Collins '414. It is contended that while the admitted prior art fails to expressly disclose performing all three processes in the same plasma chamber, Moffat discloses performing both baking and descumming resist processes in the same plasma etching chamber. Furthermore, while Moffat fails to show the plasma chamber including a wafer heating and cooling device that heats and cools the wafer via the flowing of inert gas on the backside of the wafer, Collins discloses controlling the substrate temperature using a controller where inert helium gas is used at the backside of the wafer.

The rejection of claims 1-10 under 35 USC §103(a) based on the admitted prior art, Moffat and Collins is respectfully traversed.

While the Applicants agree with the Examiner that the admitted prior art fails to disclose performing all three processes in the same process chamber, the Applicants respectfully submit such is further not taught or disclosed by Moffat.

Moffat '393 discloses a wafer processing apparatus which includes a plasma etching unit, a wet processing spin-spray unit, a robotic wafer transfer arm, and a central control computer all contained in the same housing (see Abstract). The apparatus is designed to perform manufacturing tasks especially related to photoresist processing, photoresist developing, descumming, baking and hardening, and stripping. As shown by Moffat in Fig. 16, and at col. 6, lines 56-58:

"This processing routine first develops exposed photoresist, then **hardens the resist with heat**, and **removes resist 'scum'.**"

Furthermore, at col. 7, lines 3-6, Moffat discloses:

"With the plasma chamber door closed 139, the unit pulls a vacuum below 1 Tor 140 and **starts the heating lamps**. The heating lamps are run through a predetermined temperature cycle to **hard bake** the photoresist 141."

The present invention, on the other hand, recites a method for in-situ descum/hard bake/dry etch a polyimide photoresist layer in a single process chamber. As clearly recited in independent claim 1:

"Claim 1. A method for in-situ descum/hot bake/dry etch a polyimide photoresist layer in a single process chamber comprising the steps of:

providing a process chamber ...;

positioning a wafer having a passivation layer ...;

generating an O₂ plasma in said chamber
conducting a descum process;

flowing a heated inert gas onto a backside of said wafer conducting a hot bake process; and

flowing a cooling inert gas onto said wafer backside and an etchant into said chamber conducting a dry etch process for a via opening on said wafer."

The Applicants respectfully submit that Moffat teaches a process that is patentably distinct from the present invention process in three major elements:

1. Moffat teaches a process of hard bake first and then descum (see Fig. 16), while the present invention teaches a process of descumming first and then hard bake.
2. Moffat teaches a process in which heating lamps are used for hard bake, while the present invention teaches and claims a process of hard bake by flowing a heated inert gas onto a backside of the wafer.

The Moffat process, as defined in Fig. 16, only contains the two steps of hard bake and descum, while the present invention process, as recited in independent claim 1, is a three step process of descum, hard bake and dry etch.

The Applicants further submit that none of the three major distinctions between the Moffat reference and the present invention method is taught or disclosed by Collins '414 for conducting in the same process chamber and in the same process.

The rejection of claims 1-10 under 35 USC §103(a) based on the admitted prior art, Moffat and Collins is respectfully traversed. A reconsideration for allowance of these claims is respectfully requested of the Examiner.

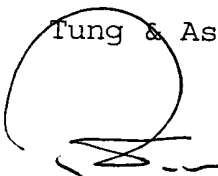
Based on the foregoing, the Applicants respectfully submit that all of the pending claims, i.e. claims 1-10, are now in condition for allowance. Such favorable action by the Examiner at an early date is respectfully solicited.

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In the event that the present invention is not in a condition for allowance for any other reasons, the Examiner is respectfully invited to call the Applicants' representative at his Bloomfield Hills, Michigan office at (248) 540-4040 such that necessary action may be taken to place the application in a condition for allowance.

Respectfully submitted,

Tung & Associates

A handwritten signature in dark ink, appearing to be 'Randy W. Tung', is written over a horizontal line. The signature is stylized with a large, circular loop at the beginning.

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